CROSS-COUNTRY DETERMINANTS OF CORPORATE YIELD SPREADS

by

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DECLARATION

I certify that the *minor dissertation/dissertation/thesis* submitted by me for the degree *Master's of Commerce (Financial Economics)* at the University of Johannesburg is my independent work and has not been submitted by me for a degree at another university.

Lebogang Maria Nkoana

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ABSTRACT

This dissertation examines the determinants of corporate bond yield spreads in developed and emerging countries. Against the fixed effects benchmark, the Pooled Mean Group regression is implemented on a panel dataset covering the period, 2014 to 2020. This study looked at 9 countries, 8 industries and 33 companies. The study applied company, industry and country specific variables identified from reviewed literature as regressors of corporate bond yield spreads. The panel is grouped by country, industry, and market development. The results of the study indicated that the determinants of yield spreads differ across developed and emerging markets. Equity volatility, exchange rate and inflation were significant in explaining yield spreads in emerging countries only. Developed markets results indicated that interest rates are significant in explaining yield spreads. Additionally, in general yield spreads are likely to be lower than in emerging markets. Industry and country effects were significant in explaining variations in corporate bond yield spreads.

Keywords: Corporate Yield Spread, Panel Data, Fixed Effects, Pooled Mean Group (PMG)

CHAPTER 1: INTRODUCTION

1.1 Contextual background to a research problem

A corporate's capital structure is important because it impacts a company's ability to attain funding, its risk profile, cost of funding and the overall returns a company makes (Antil & Grenadier, 2019). This is because the capital structure reflects the company's debt versus equity holding that the business uses to fund its daily operations (Dhankar, 2019). A company's debt and equity structures are critical as they are reflected on a corporates financial statements and will indicate the company's profitability, risk profile, and overall stability (Seissian, Gharios, & Awad, 2018).

Over the past years, there have been various studies that aimed at determining an optimal capital structure that will increase the company's profitability and stability. Modigliani and Miller (1958) explain that by minimising the weighted average cost of capital (WACC), corporations can obtain a higher net present value (NPV), which shows a higher overall company value. Antil and Grenadier (2019) as well as Tian (2016), amongst others, explain that an optimal capital structure is attained by finding each company's best blend of debt and equity that will provide the lowest WACC.

Theoretically, financing through debt has the lowest cost because the interest payments have tax benefits and debt has lower risk as is seen as an obligation, therefore during a dissolution of a company, debt holders are paid first (Dhankar, 2019). Even so, companies will not benefit by fully funding through debt as debt has a large impact on their risk profile, such as credit rating (Dhankar, 2019).

There are mainly two avenues in which corporations prefer to raise debt. These are through a bank loan or by issuing bonds on a bond exchange market. Bank for International Settlements (2002) has stated that bank loans often charge an interest rate that is higher than the interest charges on bond issuance. Bond issuances are also liquid because the holder can sell their holding to other market participants at any point during the life of the bond (Antil & Grenadier, 2019). This, then gives an incentive for companies to raise resources through the bond market because of the lower costs and a larger number of market participants.

The interest rate charged by a bank on a loan is like a yield spread over a benchmark quoted on a bond issuance by a company. Since the interest rate on a loan is seen as the cost of borrowing, so is the yield spread seen as a cost of borrowing on a bond (Zhang & Zhu, 2020). A yield spread is defined as the difference between the yield to maturity of a corporate bond versus the yield to maturity of the benchmark bond (Radier, Majoni, Njanike, & Kwaramba, 2016). The benchmark bonds used to quote these issuances are usually a risk-free government bond with a similar term to maturity or a reference rate for a specific term.

The yield spread is the varying risk premium that investors assign to companies, which includes the credit, liquidity and market risk as the company responses to financial shocks during its business cycle (Morgan & Murtagh, 2012). This also means, the higher the risk associated with the issuing corporation the higher the yield spread on the bond issued by the company (Campbell, 1993). Also, the lower the risk related with the issuing company, the lower the yield spread on the bond issued (Campbell, 1993).

1.2 Research problem and question

Avramov, Jostova, and Philipov (2007) use company level characteristics and market rates to explain the credit spread variation. However, findings from their study could only explain 68%, 55% and 36% of the changes in low, medium and high-grade bonds respectively. Radier et al. (2016) studied the causes of changes to bond yield spreads. The authors used an Ordinary Least Squares (OLS) regression to regress the yield spread changes to the changes in the stock price volatility, interest rate and credit ratings. Their study concluded that changes in stock price volatility and interest rate levels are statistically significant in explaining changes in the yield spreads. However, they further explain that their findings indicated that there may be other unobserved factors they did not account for that may be key in determining changes in yield spreads, more specifically industry and country specific factors.

Garay, González, and Rosso (2019) conductes a study on the effects on yield spreads using company, industry and country variables in 13 emerging countries employing a Pooled Ordinary Least Squares (Pooled OLS) method. The rationale of their study was to expand on various past studies that mostly apply company specific factors in the models. In contrast to results from Durbin and Ng (2005), their findings concluded that both country and industry variables are statistically significant at 99% level in explaining changes in corporate bond yield spreads in emerging countries.

Various studies have been conducted to determine variables that influence changes in yield spreads over the years in different regions of countries. However, could not find evidence to support any work done on the determinants of changes in corporate yield spreads would be different between emerging and developed countries. Gadanecz, Miyajima, and Shu (2014) state that there are specific factors that impact the performance of emerging markets differently to developed markets. Jaramillo and Weber (2013) explain that investors tend to discriminate against emerging markets during times of market volatility. Investors perceive emerging markets as riskier than developed and tend to flee to developed markets when the market is volatile (Bellas, Papaioannou, & Petrova, 2010). This causes emerging markets to react more aggressively to market movements than developed markets. Gadanecz et al. (2014) also explain that variables such as exchange rate risk are a more prevalent factor in explaining yield spread changes in emerging markets than in developed countries. Therefore, there is a need to understand which determinants affect changes in corporate yield spreads in emerging and developed markets.

In light of previous literature conducted on this topic, this empirical study aims to expand on studies conducted by Garay et al. (2019), Gadanecz et al. (2014) as well as Campell and Taksler (2003) who considered drivers of changes in coporate yield spreads using a combination of company, industry and country specific variables in their papers. Our approach aims to use company, industry and country specific determinants identified in the previous studies to analyse whether the determinants of changes in yield spreads are different for corporate bonds originated in emerging and developed countries.

1.2.1 Research question

Are the determinants of corporate yield spreads different across emerging and developed markets?

1.3 Research objectives

The primary objective of this study is to answer the research question under section 1.2.1. Secondary objectives of this study include the following:

(i) to determine the variables that cause changes in yield spreads.

(ii) to determine whether industry characteristics play a role in explaining corporate yield spread.

(iii) to determine whether country characteristics play a role in explaining corporate yield spread.

(iv) to compare the performance of corporate yield spread modelling across static and dynamic panel frameworks

To answer the research question and meet the secondary objectives, the following steps will be followed:

a) First, the study will define yield spreads and the importance thereof.

b) Second, the study will review existing empirical studies to identify the determinants of changes in yield spreads.

c) Third, the study will review existing empirical studies which have examined changes in yield spreads using static panel data techniques such as pooled and fixed effect panel regression techniques, as well as identify dynamic panel data techniques that can be used for this study;

d) Last, the study will estimate the static and dynamic panel models of corporate yield spread

1.4 Significance of the research

Corporate bond yield spreads are usually quoted over government bonds and indicate the cost of financing for corporate firms (Radier, Majoni, Njanike, & Kwaramba, 2016). When we observe higher spreads, then the cost of capital is higher. Given that

investment in physical capital is an important driver of economic growth, it is very important to find out what are the drivers of the cost of financing for corporates to identify the determinants of productive investment (Radier et al., 2016). Furthermore, corporates are impacted by the country the corporate is situated in. Generally speaking, unlike emerging countries, developed countries have further advanced infrastructure, economies and standard of living (Bank for International Settlements, 2002). Emerging markets are still in the developing stages of their industrialisation process and still have the potential for fast growth. This also means that emerging markets exhibit higher risk (Radier et al., 2016). Radier et al. (2016) further explain that emerging markets are usually dependent and are closely impacted by the circumstances in developed markets. Therefore, it is important to compare the determinants of yield spreads across market's level of modernisation.

CHAPTER 2: LITERATURE REVIEW

2.1 Defining Corporate Yield Spread

A yield spread is defined as the difference between the yield to maturity of a corporate bond and the yield to maturity of the benchmark bond (Radier et al., 2016). The benchmark bond is the risk-free government bond with a similar term to maturity or a reference rate for a specific term. The yield to maturity on a bond denotes the anticipated total return on a bond when it is held to maturity (Zhang & Zhu, 2020).

Government bond yields are an essential part of pricing corporate bonds (Durbin & Ng, 2005). Durbin and Ng (2005) explain that this is because the government hold the ability to divert resources from the corporate sector to fiscal requirements, which indicates that corporate borrowers are only as safe as the government is. Additionally, the sovereign ceiling rule dictates that a corporation's credit rating cannot be better than the government (sovereign) credit ratings. This suggests that the government bond is perceived as the risk-free yield to maturity, and acts as a floor for all bond issuances from that country. This simply implies that a corporation's bond yields will in general be higher than bond yields. This does not mean that the sovereign ceiling cannot be violated; there are instances where the company is perceived to have a better credit rating than the government. A case in point is a multinational company guaranteed by the holding company[1]. However, the general case is that government yields are seen as the risk-free yields and are used as the benchmark.

A corporate's yield spread is then seen as the varying risk premium that corporate lenders assign to companies, which includes the credit, market and liquidity risk as the corporate responds to financial shocks during its business cycle (Morgan & Murtagh, 2012). This means that higher corporate yield spreads indicate how lenders require higher compensation for the higher risk perceived from the company they are lending to. The alternative is also correct, low corporate yield spreads indicate the lower risk perceived from the company they are lending to.

[1] For more information on violations to the sovereign rule, see Durbin & Ng (2005).

From this, it is easy to identify why various studies have explored this topic and tried to understand what drives changes in corporate yield spreads. From a corporate's perspective, companies would want to understand the factors that impact the yield spreads as it will impact their cost of funding which has a large impact on their profits. This will mean they will recognise which factors to focus on to proactively manage their cost of funding in the market. From an investor's perspective, this enables lenders to more accurately analyse the risk and return of their investment and also assess possible moves in corporate yield spreads and make the appropriate decisions for their investments.

2.2 Determinants of Changes in Yield Spreads

The theoretical framework of this study is the performance of empirical analysis for yield spread determination based on important explanatory variables identified through the past years by researchers. Several studies have attempted to assess the determinants of yield spreads over the past years. Garay et al. (2019) explained yield spread changes by studying company, industry, and country variables. Radier et al. (2016) also explained yield spread changes using company-specific and bond characteristics. Cavallo and Velenzuela (2010) took an option-adjusted spread view when explaining yield spread changes in corporate bonds. In this section, we briefly review the literature regarding the determinants of corporate bond spreads in various countries.

Avramov et al. (2007) used structural models to study the impact of equity volatility, equity price and interest rates on yield spreads. Their sample consisted of US corporate bonds; they used vanilla floating rate bonds only and filtered out bonds with special covenants and lastly, they ran the models by dividing the bonds by means of their credit rating bucket. The results indicated that equity volatility was a significant variable with a positive coefficient. The authors determined that when the equity return and the interest rate increase, then yield spreads should in turn decrease. Therefore, the authors realised a negative relationship that is statistically significant between the yield spread and equity return, as well as the interest rate, respectively.

However, Radier et al. (2016) found the effect of interest rate to be conflicting in different rating buckets. In the rating bucket BBB, the coefficient showed a negative relationship, which is consistent with the literature. In all other rating buckets, the coefficient was of a positive sign which indicates that an increase in interest rates causes an increase in yield spreads. Radier et al. (2016) used panel regressions to model the link between the levels of interest rates compared to yield spreads in South Africa and from their study they indicated that the results were inconclusive for interest rates.

Campbell and Taksler (2003) used a fixed effects panel OLS regression model, to study the impact of equity volatility on yield spreads in the US. In their study, Campbell and Taksler (2003) specified that a company's total volatility can be proxied by equity market volatility also known as the idiosyncratic equity volatility. With similar findings, Avramov et al. (2007) along with Campbell and Taksler (2003) concluded that equity volatility is a determinant of changes in yield spreads on corporate bonds. Campbell and Taksler (2003) explained that the fixed effects panel OLS regression model allowed them to observe the same entities for each period, studying the impact of the explanatory variables that vary over time. But Campbell and Taksler (2003) also explain that structural models do not apply to investment-grade bonds as they rarely default and recommend less structured econometric analysis that analyses the data cross-sectionally as applied in their study.

Garay et al. (2019) specified that the debt-to-equity (D/E) ratio, inflation and years-to-maturity are important drivers and were found relevant in explaining yield spreads. Garay et al. (2019) used a fixed effects panel OLS regression model to study corporate bonds from 13 emerging countries and 8 industries. The authors found that the D/E ratio had a positive coefficient and was statistically significant in explaining changes in yield spreads. Garay et al. (2019) also found that inflation had a positive and significant coefficient which means that the higher the inflation of a country, the higher the yield spread on corporate bonds. Ntshakala and Harris (2018) also found that inflation is important in explaining changes in bond yield spreads when using panel OLS regression to study yield spreads in an emerging market like, South Africa.

A negative years-to-maturity coefficient that is statistically significant at a 99% confidence level was found by Garay et al. (2019). Their findings were contrary to the literature, because their findings indicated that an increase in years-to-maturity showed a decrease in the yield spread. Garay et al. (2019) further explain that the negative sign could be because the term structure of corporate bonds is mostly negatively sloped. This means that longer term maturities have lower spreads. But a fixed effects panel OLS regression model by Cavallo and Velenzuela (2010) also studied yield spreads in 10 emerging countries and found the expected positive coefficient for years-to-maturity which was also significant at a 99% confidence level. Their study used a panel OLS regression model. They concluded that the longer the term remaining the higher the risk taken by the investor, therefore, the higher the yield spread on corporate bonds in emerging markets.

Grandes and Peter (2004) used a fixed effects panel OLS regression model to also study debt-to-equity (D/E) and time-to-maturity as drivers of yield spreads in South Africa. Their findings showed that the D/E ratio was statistically significant in explaining changes in yield spreads. The results were as expected from the literature, as Grandes and Peter (2004) observed that an increase by 0.5% in the debt-to-equity ratio caused an increase in the yield spread by 130 bps (1.3%).

In their study, Grandes and Peter (2004) found that the years-to-maturity was statistically significant in explaining changes in the yield spreads. However, opposite to their expectations, the results showed that years-to-maturity had a negative relationship with yield spreads. They indicate that an increase of 1 year in the years-to-maturity showed a decrease in the yield spread by 30 bps. This was contrary to findings by Cavallo and Velenzuela (2010), but similar to findings by Garay et al. (2019) who explained that this was because the term structures of corporate bonds are usually negatively sloped.

Gadanecz et al. (2014) studied the impact of the changes in the exchange rate on bond yields in emerging markets using a fixed effect panel OLS regression. The authors explain that investors are exposed to the exchange rate risk on their bond positions and therefore exchange rate movements will influence bond yields. Gadanecz et al. (2014) found that the appreciations of the exchange rate for the

emerging country had a positive and significant coefficient at a 99% confidence interval for corporate bonds issued in the emerging country of the study. The study was not extended to developed countries, because the authors explained that exchange rate movements play a greater role in explaining yield spread movements in markets with higher volatility.

Cavallo and Velenzuela (2010), Durbin and Ng (2005) as well as Garay et al. (2019) all accounted for industry and country effects on changes in the yield spread by assigning dummy variables for variable industries and countries. A positive coefficient means that when the issuer is in a specific industry, the yield spread is expected to increase. And when the coefficient is negative, we expect the yield spread to decrease.

From their study, Cavallo and Velenzuela (2010) stated that industry effects were economically and statistically significant in explaining corporate yield spreads. This is similar to findings by Garay et al. (2019), who found that three out of the five industries studied have industry specific characteristics that are statistically significant in explaining changes in the yield spread. These industries were telecommunications, basic materials, and energy. However, Durbin and Ng (2005) found conflicting results to Garay et al. (2019) along with Cavallo and Velenzuela (2010). Durbin and Ng (2005) conducted a panel regression with fixed effects to study the impact of industry effects in emerging countries. Their study analysed 7 industries including, telecommunications and energy industries. Durbin and Ng (2005) found that none of the industries presented a significant relationship in explaining the yield spread of corporate bonds.

2.3 Consideration of Emerging versus Developed Markets

The country the firm operates in is a critical factor in the determination of corporate yield spreads. previously mentioned, the yield to maturity of a government bond serves as the benchmark for corporate bonds, and yield to maturities of corporate bonds are usually higher than government bonds as there is a premium to account for the larger risk associated with the company over the perceived default risk-free government. However, there are other reasons why the country is also important in this case, mainly the countries level of development.

A country's level of development is indicated by the level of advancement in infrastructure, economies and standard of living (Radier et al., 2016). In general, developed markets differ from emerging markets in several manners that influence the impact of bond yield spread determinants. Firstly, developed markets have economies that are larger in size and more liquid (Radier et al., 2016). Secondly, because of the level of development countries in developed markets will have different fiscal and monetary policies that may not be applied in emerging countries. Some of the emerging markets will have certain controls applied to their interest rates, inflation and exchange rate policies that are vastly different to developed markets. An emerging economy, for example, South Africa (SA), the reserve bank has a monetary policy that is fixed on an inflation-targeting framework (Akinboade, Siebrits, & Niedermeier, 2004). Compared to the United States (US), SA has two of the key differentiating determinants of inflation, namely, labour costs and the Rand exchange rate fluctuations (Akinboade et al., 2004).

Finally, there is a large difference in the credit quality of developed and emerging countries. Developed economies usually have high credit ratings. For example, US Fitch rating was assigned AAA[2] from July 2020. Whereas emerging economies usually have vastly lower credit ratings. For example, SA Fitch rating was assigned BB[3] in April 2020. The AAA indicates the highest credit quality, whereas BB denotes non-investment grade[4]. This indicates the vast difference in the outlooks of the credit and default risk of countries in developed and emerging economies. This difference is important because the market incorporates the sovereign credit rating in corporate bond yields (Durbin and Ng, 2005).

2.4 Conclusion

Based on the previous studies on the determinants of changes in yield spreads, the present dissertation aims to contribute to the existing literature by considering the

[2] See US credit rating history on https://tradingeconomics.com/united-states/rating.
[3] See SA Credit rating history on https://tradingeconomics.com/south-africa/rating.
[4] See https://www.fitchratings.com/products/rating-definitions#about-rating-definitions for Fitch rating definitions.

differences in developed and emerging countries when assessing determinants of corporate yield spreads. An additional contribution of this study is to expand on past studies that have predominantly used the fixed effects panel regression model in evaluating this topic. This paper will expand the use of static panel regression techniques to use a dynamic panel model, pooled mean regression to investigate the difference in the dynamics of corporate yield spread across emerging and developed markets using market data from 2014 to 2020.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents an outline of the econometric methodology applied in the study. The methodology follows a 6-stage process. Firstly, heterogeneity bias across the data observations and its implications for the analysis to be conducted will be discussed. Second, the chapter examines the issue of stationarity in the data and its associated consequences for econometric analysis. Third, the implication of cointegration will be analysed. Next, an overview of the fixed effects static panel data model, which addresses heterogeneity bias will be outlined. In addition, we consider the limitations of fixed effects panel data model when applied to this study. Finally, we present the pooled mean group (PMG) model to address the shortcomings of the static panel model.

3.2 Heterogeneity bias

The panel data series modelling primarily aims at addressing the possible dependence across data observations within the same group (Mummolo & Peterson, 2018). In fact, the main difference between panel data and time series models, is that panel data models allow for heterogeneity across the groups and present individual-specific effects (Breitung & Pesaran, 2005). Heterogeneity bias is one of the most common problems with panel data modelling. This arises when the explanatory variables used in the panel analysis are affected by different factors across individuals and across time (Breitung & Pesaran, 2005).

With panel data modelling, one of the main assumptions is that the dependent variable is a function of an explanatory variable set, which impact the individual units in an identical form at all times (Breitung & Pesaran, 2005). Therefore, excluding any individual and time specific effects that exist in cross-sectional units will result in unreliable parameter estimates due to heterogeneity bias. Coakley, et al. (2006) indicated that large T panel literature has highlighted that unobserved, time-varying heterogeneity may stem from omitted common variables that affect each individual

unit differently. If the common factors induce cross-section dependence, they may lead to inconsistent regression coefficient estimates if they are correlated with the explanatory variables (Coakley, et al., 2006). Additionally, if the process underlying the common factors is nonstationary, the individual regressions will be spurious for short- run Coefficients (Coakley, et al., 2006). Static panel models, like the fixed effects or random effects models, are able to account for heterogeneity bias which allows for individuals intercepts but a homogenous slope coefficient (Breitung & Pesaran, 2005).

3.3 Stationarity

A panel data series that consists of short time frames presents little concern about stationarity. On the other hand, a panel data series that consists of longer time frames must be tested for stationarity. When the variable is plotted throughout the time frame, the graph will not be smooth; there will be some periods when there will be up and down shocks. The rationale for testing for stationarity is to verify whether the effect of these shocks is temporary or permanent (Chen, 2006). In a panel with large T, it is important as the series may contain nonstationary unobserved common factors that may cause incorrect results. When the effect of shock is temporary, the value of the variable in the following periods will revert to its long-term equilibrium. When the effects of shocks in a data set are mean reverting, then the data is stationary (Chen, 2006).

The opposite also exists, when the effects of the shocks in the data set are not mean reverting, then the variables are nonstationary (Chen, 2006). This signals that the effects of the shocks are integrated into the system and becomes part of the system (Chen, 2006). This then may cause spurious regressions which may lead to false conclusions. The issue may arise if and only if stationarity is ignored. When it comes to panel data, testing for stationarity entails testing the individual cross sections for the presence of a unit root (Chen, 2006).

A large amount of literature and research surrounding panel data unit root tests has been conducted. The Fisher-ADF test is the panel unit root tests used by a few researchers. The Fisher-ADF requires that ADF unit-root tests be conducted for each cross section and the p-values to measure statistical significance from the individual unit roots tests are combined (Maddala & Wu, 1999).The ADF test examines the potential serial correlation in the error term into account (Maddala & Wu, 1999). This is attained by including lagged terms of the dependent variable (Maddala & Wu, 1999). The maximum lags length being selected using the Akaike info criterion (AIC). Maddala and Wu (1999) indicate that there are several suggestions about the p-value combinations, however, explains that no combination is superior to the other. This paper assigns the log-p-values as widely most used (Maddala & Wu, 1999). The probabilities for the Fisher tests are computed using an asymptotic Chi-square distribution.

The null and alternate hypotheses of the ADF test are given by:

H_0: $Presence\ of\ Unit\ Root$

H_1: $No\ presence\ of\ Unit\ Root$

This means that by rejecting the null hypothesis we indicate that all the individual time series are stationary. This is because a unit root indicates a stochastic trend in the data, for example, when the effects of the shocks in the data set are not mean reverting. Whereas, by failing to reject the null hypothesis the induvial time series are seen as nonstationary and therefore have shocks that are mean reverting.

3.4 Estimation Techniques

3.4.1 Fixed effects model

Panel regression models allow for specific behaviours of cross-sectional units, namely, countries, industries or companies. This paper will use the fixed effects panel regression model which examines entities' difference in intercepts (Garay et al., 2019). The fixed effects model is the most widely used model used to study determinants of yield spread and has been used by authors such as Cavallo and Velenzuela (2010), Grandes and Peter (2004) and Garay et al. (2019) in their studies. The fixed effects panel regression model is meant to analyse the impact of the explanatory variables

that are time variant and invariant (Garay et al., 2019). The approach used for fixed effects will be the Least Squares Dummy Variable (LSDV) model. This model assumes the same constant and slope variance across entity's (Garay et al., 2019).

Given the linear unobserved effects model for n observations and t time periods. The fixed effects model is a linear regression where the intercept terms vary over the individual units i, the model can be stated as

$$y_{it} = \alpha_i + x_{it}\beta + \varepsilon_{it}, \qquad (3.1)$$

Where y_{it} represents the yield spread. α_i represents or captures the individual-specific effects, in this paper these are industry or country-specific effects, and x_{it} represents the exogenous variables used in the model. The fixed effects model has a key assumption that all x_{it} are independent of all ε_{it}, $\mathrm{E}[x_{it}, \varepsilon_{it}] = 0$. The estimator β is the coefficients of the explanatory variables obtained by performing the regression in deviations from individual means. Consequently, by first differencing the fixed effects model, we eliminate individual effects α_i. Equation 3.1 can be written as follows:

$$\bar{y}_i = \alpha_i + \bar{x}_i\beta + \bar{\varepsilon}_i, \qquad (3.2)$$

where $\bar{y}_i = T^{-1}\sum_t y_{it}$ and represents the average. Likewise, for the other variables. The result leads to the regression being written as

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)\beta + (\varepsilon_{it} - \varepsilon_t). \qquad (3.3)$$

Equation 3.3 is a regression model that deviates from individual means and excludes the individual-specific effects α_i. The applied transformation is called the within transformation. The Ordinary Least Squares estimator for β attained from the transformed model is referred to as the fixed effects estimator or within estimator (Mummolo & Peterson, 2018).

For this study, the fixed effects model is stated as

$$YS_{it} = x'_{it}\beta + \varepsilon_{it} \qquad (3.4)$$

Where, the subscript $i = (1 \dots N)$ and is the respective cross-sections, either country, industry, or level of development. YS_{it} is the yield spread for the cross section i at time t, $t = (1 \dots T)$. x'_{it} lists the variables used as identified from the literature. These include equity price, equity volatility, debt-to-equity ratio, years-to-maturity, interest rates, inflation, and the exchange rate. β, then lists the coefficients of the enumerated variables and ε_{it} is the error term that is independently and identically distributed.

The fixed effects regression model has a few key assumptions. Firstly, it assumes there is a linear relationship between the dependent and explanatory variables. Secondly, the model assumes strict exogeneity of regressors, therefore the expected value of the errors is zero and the errors are not correlated to the regressors. Thirdly, the model assumes homoskedasticity; the errors have the same variance and are not correlated to one another. Fourthly, the observations of the independent variables are assumed to not be stochastic but fixed in repeated samples without measurement errors. Finally, the model assumes that there is no multicollinearity in the explanatory variables.

3.4.2 Shortcomings of fixed effects models in the analysis of determinates of changes in Yield Spreads in emerging and developed markets

While static panel data models are capable of addressing problems of heterogeneity bias in panels, some scholars have argued that such models are likely to suffer from some shortcomings. The main shortcoming that impacts this study is that of cross-sectional dependence. Cross-sectional dependence exists when all units in the same cross-section are correlated (Burdisso & Sangiacomo, 2016). Burdisso and Sangiacomo (2016) further explain that cross-sectional dependence attributed by effects from some unobserved common factors that are shared by all units, each being affected differently. Cross-sectional dependence is likely in panel time series (T>N) as it is the case in this study. To overcome these difficulties, variants of panel unit root tests are developed that allow for different forms of cross-sectional dependence. Static panel models (for example fixed or random effects) and the MG estimator only solve for homogeneity. However, when the common factors not included in the model are

correlated to the independent variables (cross-sectional dependence), the static and MG models are inconsistent.

3.4.3 Pooled Mean Group Estimator

It is now quite common to have panels in which both T, the number of time series observations, is greater than N, the number of cross-sections. In this case of long panels in which the time dimension is sufficient for estimating separate regressions for each individual, they can be referred to as a panel time series (Smith & Fuertes, 2012). Traditional estimation approaches, such as the fixed effects, have the purpose of correcting the fixed-effect heterogeneity issue that occur in the case of large N and small T panels (Smith & Fuertes, 2012). The estimators would produce inconsistent results as they do not take endogeneity caused by the lag dependent variable into consideration (Smith & Fuertes, 2012).

The typical approach to these circumstances is either to estimate N separate regressions and calculate the coefficient means, this is referred to as the mean group (MG) estimator (Burdisso & Sangiacomo, 2016). However, the MG estimator does not take cross-sectional dependence into account. Alternatively, the pooled mean group (PMG) estimator can be used which accounts for cross-sectional dependence (Burdisso & Sangiacomo, 2016).

Another advantage of the PMG is the ability to analyse both stationary and nonstationary variables in the time series; however, with the condition that cointegration exists between the variables (Chrysost & Eggoh, 2012). Additionally, the PMG is robust to the outliers and lag orders when compared to the MG (Burdisso & Sangiacomo, 2016). Furthermore, the PMG estimator requires long-run coefficients across cross sections to be similar but allows for differences in the short-run coefficients, error variances, and the intercepts (Burdisso & Sangiacomo, 2016). Thus, the PMG estimator has become popular among the researchers using panels in recent years

The model for the PMG estimator is presented as shown below:

$$y_{it} = a + \gamma y_{i,t-1} + x_{it}\beta + \alpha_i + \varepsilon_{it} \qquad (3.5)$$

This is a linear model, where, a is the constant and α_i demonstrates the individual-specific effects, industry and country-specific effects. x_{it} represents the (k × 1) dimensional vector of explanatory variables used in the model and β their respective coefficients. $y_{i,t-1}$ refers to the lagged dependent variable and γ the respective coefficient.

The first difference of the model is then depicted as

$$\Delta y_{it} = \Delta\gamma y_{it-1} + \Delta x_{it}\beta + \Delta\varepsilon_{it} \qquad (3.6)$$

The PMG estimator has a few key assumptions that need to be made about the error term:

(i) the error term has a multifactor error structure.

(ii) the errors are independently distributed across i and t;

(iii) the errors have a mean and variance of zero and larger than zero, respectively; and

(iv) there is no correlation between the errors, the regressors nor the unobserved common factors.

The PMG model can model the short and long-run relationships between the dependent variable and explanatory variables. Various literature such as Chrysost and Eggoh (2012) along with Burdisso and Sangiacomo (2016) state that there are mainly two misconceptions when it comes to the PMG model. Firstly, that long-run relationships exist only in the context of cointegration among integrated variables. And secondly that standard methods of estimation and inference are incorrect.

The authors explain that the main requirements for validity of this methodology are that, firstly, a long-run relationship exists amongst the variables of interest. Secondly, the dynamic specification of the model must be sufficiently augmented for the

regressors to be strictly exogenous and the resulting residual is serially uncorrelated. To comply with the requirements for standard estimation and inference, a long-run growth regression equation was embedded into an ARDL (p, q) model. In error correction form, this can be written as follows:

$$\Delta(y_i)_t = \sum_{j=1}^{p=1} \gamma_j^i \, \Delta(y_i)_{t-j} + \sum_{j=0}^{q=1} \delta_j^i \, \Delta(x_i)_{t-j} + \varphi^i \left[(y_i)_{t-1} - \{\beta_0^i + \beta_1^i \, (x_i)_{t-1}\}\right] + \varepsilon_{it} \quad (3.7)$$

Where y_i is the yield spread and x denotes the vector of independent variables. γ and δ represents the short-run coefficients for each explanatory variable. The long-run coefficients are explained by β. The long-run growth regression is present in the term that is in the square brackets in equation 3.7. The coefficient φ measures the speed of adjustment to the long run to revert to the mean also known as the error correction term, the random variable/component ε expresses a time-varying error term. Subscripts i and t, where $i = (1 \ldots N)$ and $t = (1 \ldots T)$, represent the cross-section and time, respectively.

The error correction coefficient demonstrates how fast variables converge/diverge to equilibrium and it should have a statistically significant coefficient with a negative/positive sign (Burdisso & Sangiacomo, 2016). The highly significant Error Correction Term further confirms the existence of a stable long-run relationship between the independent variable and the explanatory variables.

3.5 Conclusion

In conclusion, this study notes that due to problems related to heterogeneity bias, stationarity and cross-sectional dependence in the data, the PMG estimator is the most suited for studying the difference in the determinants of yield spreads in emerging and developed markets.

CHAPTER 4: DATA, ESTIMATION AND EMPIRICAL RESULTS

4.1 Introduction

In this chapter, we describe the sample data selected for the study, estimate the econometric models and finally, discuss the empirical results**.** For this research, we retrieved corporate bond data and supporting reference data from Thomson Reuters through Eikon. The bonds were sourced from the 1st of January 2014 to the 31st of July 2020 monthly and all prices were denominated in US dollar terms and the exchange rate was quoted against the Euro. The corporate bonds sourced were from emerging markets; South Africa, Brazil, Mexico, and India; as well as developed markets; the United Kingdom, Austria, Italy, Switzerland, and the United States of America. This data set was selected based on data availability. Table 4.1 illustrates the number of corporate bonds per country included in this study.

Table 4.1: Number of Corporate Bonds

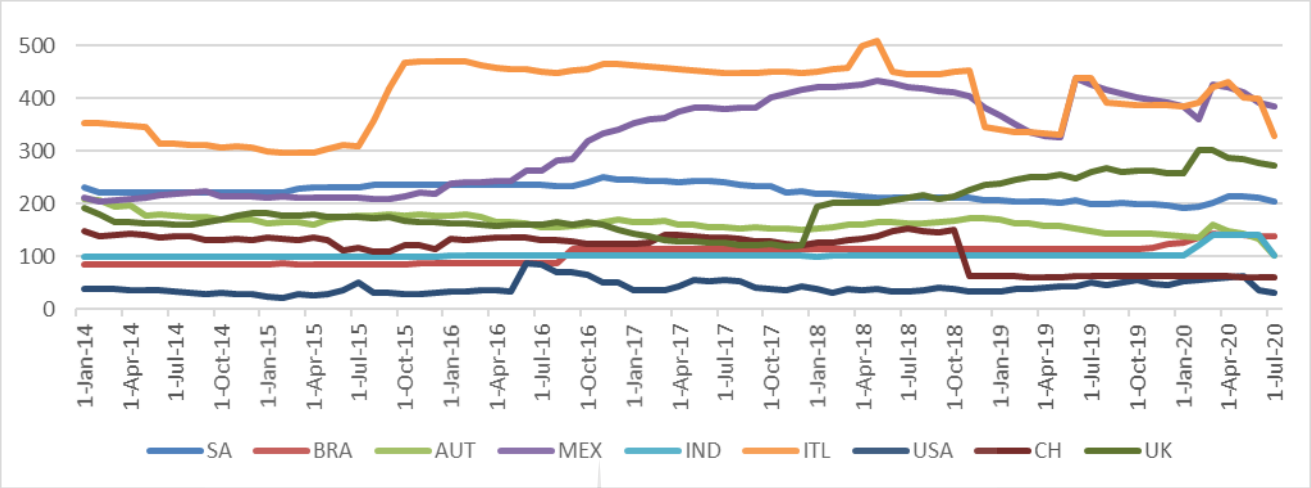
Market	Country	Abbreviation	No. of Bonds
Emerging	South Africa	SA	8
	Brazil	BRA	4
	Mexico	MEX	13
	India	IND	2
Developed	Austria	AUT	8
	Italy	ITL	12
	United States of America	USA	9
	Switzerland	CH	5
	United Kingdom	UK	3
		Total	64

Note: We included the individual bonds even if a company has issued multiple bonds.
Source: Eikon Reuters

The study only uses floating rate bonds, with maturities of more than 2 years. We also exclude bonds that have special redemption covenants, such as callable, puttable, step and sinkable features. Bonds with variable coupons are also excluded. This is similar to studies by Garay et al. (2019) and Radier et al. (2016), that also used floating rate bonds because bonds with special features may be affected unexpectedly to the

norm and may need to be studied separately. Figure 4.1 below illustrates the average yield spread in basis points per country.

Figure 4.1: Average Yield Spread (bps) per Country



From the graph, we can observe that Austria, Brazil, India and South Africa have yield spreads that have been pretty consistent throughout the sample period, with minor increases to the average yield spread in February 2020. This is maybe because of the Covid-19 pandemic.

4.2 Data and preliminary analysis

The yield spread (**YS**) will be analysed using regressors identified in the literature review. The seven variables used for the econometric models include equity price (**EQ**), equity volatility (**VOL**), debt-to-equity ratio (**DE**), years-to-maturity (**YTM**), interest rates (**IR**), inflation (**INFL**) and the exchange rate (**EXCH**).

4.2.1 Variables description

4.2.1.1 Dependent variable

YS: The yield spread of the bonds is calculated in Reuters as the marked-to-market spread on the corporate bond less the marked-to-market spread on the reference bond.

4.2.1.2 Independent variables

EQ: The equity price is explained as having a negative relationship with the yield spread, according to Avramov et al. (2007). The authors explain that an increase in the share price is an indicator of an increase in the value of a company; thereby decreasing the risk associated with the issuer and causing yield spreads to decline.

VOL: The equity volatility expresses the volatility of the equity stock of the issuer. Campbell and Taksler (2003) explain that higher equity volatility will increase the yield spreads on the bonds issued by the company. A company with more volatile equity is more likely to require additional compensation in the form of higher yield spread over the benchmark rate, because the volatility will change the expected payoff of the corporate bond. Therefore, exhibiting a positive relationship between equity volatility and yield spread.

DE: The debt-to-equity ratio measures a company's leverage by comparing its debt versus equity levels. Garay et al. (2019) identify a positive relationship between the yield spread and the debt-to-equity ratio. This is because when the profile of a company is perceived as riskier because of high debt levels, investors will require a higher yield spread on bonds issued to compensate for the larger risk they are taking (Morgan & Murtagh, 2012).

YTM: The years-to-maturity measures the time in years left on the issued bond. From their study, Grandes and Peter (2004) concluded that the longer the term remaining the higher the risk taken by the investor, and drives the yield spread on corporate bonds higher. Therefore, this study expects the relationship between the years-to-maturity and yield spread to be positive.

INFL: The inflation rate is expected to have a positive relationship with yield spreads for corporate bonds. This is because higher inflation is an indication of future economic imbalances which will negatively affect local companies (Garay et al., 2019).

IR: The interest rate should yield a negative coefficient (Chebbi & Hellara, 2010). This is because, high interest rates imply high reinvestment rates, which increases a company’s future value and reducing yield spreads on bonds (Avramov et al., 2007).

EXCH: Exchange rate risk is also expected to have a positive relationship. Gadanecz et al. (2014) explain that large currency fluctuations may cause mismatches in the balance sheet of companies; mainly in emerging markets; that conduct a lot of international business. That may in turn increase yield spreads on corporate bonds.

4.2.2 Summary statistics

Table 4.2 in the appendix, displays the descriptive statistics of each panel employed in this study. These panels are grouped according to country, industry, Market development (Market), Developed markets and Emerging markets. For all variables, the Jarque-Bera test probability is less than 0.05. which means the data has the skewness and kurtosis that do not match a normal distribution. The data is not normally distributed.

Table 4.2: Descriptive Statistics

Panel A: Descriptive Statistics of the Variables grouped by Country							
	Obs.	Mean	Std. Dev.	Max	Min	Jarque-Bera	Prob.
YS	632	177.0332	137.6430	655.8500	20.2450	425.6139	0.0000
DE	632	376.8644	479.9562	2717.4700	48.7377	3045.1340	0.0000
EQ	632	599.6711	1376.6800	5795.3990	1.9936	1073.5790	0.0000
EXCH	632	15.4820	24.4897	90.6710	1.0414	544.5948	0.0000
INFLATION	632	6.7653	19.4920	106.8900	-1.3700	13462.5600	0.0000
IR	632	2.5976	2.9871	8.2500	-0.7500	71.7643	0.0000
VOL	632	44.5606	48.2743	272.5008	12.4350	2772.2570	0.0000
YTM	632	31.5580	77.5593	293.9575	-23.7547	871.1057	0.0000
Panel B: Descriptive Statistics of the Variables grouped by Industry							
	Obs.	Mean	Std. Dev.	Max	Min	Jarque-Bera	Prob.
YS	711	184.6427	116.8903	509.5955	20.9810	107.8675	0.0000
D_E	711	900.0207	1383.1580	5764.3260	23.0004	1026.3310	0.0000
EQ_PRICE	711	1486.8680	3871.9840	16963.7500	8.7550	1655.6410	0.0000
EQ_VOL	711	27.8683	10.3605	62.5612	10.0807	100.5516	0.0000
EXCH	711	13.8542	23.5424	90.6710	0.7021	829.5308	0.0000
INFLATION	711	6.0679	18.4815	106.8900	-1.3700	19552.9300	0.0000
IR	711	2.3207	2.9248	8.2500	-0.9000	89.8738	0.0000
YTM	711	6.8037	3.0320	14.5048	0.7212	16.8211	0.0002
Panel C: Descriptive Statistics of the Variables grouped by Level of development							
	Obs.	Mean	Std. Dev.	Max	Min	Jarque-Bera	Prob.
YS	158	184.9343	20.1394	229.3289	152.6705	8.7333	0.0127
D_E	158	957.9226	539.7090	1790.7590	419.3817	20.5485	0.0000
EQ_PRICE	158	1656.4450	1584.3340	4431.5040	80.0489	20.3434	0.0000
EQ_VOL	158	28.1169	6.1523	45.7916	16.7513	11.2135	0.0037
EXCH	158	15.4500	14.4358	33.4171	0.9983	25.9032	0.0000
INFLATION	158	6.7321	9.8949	30.3875	0.0600	91.1030	0.0000
IR	158	2.6177	2.7661	6.5625	-0.2900	21.9423	0.0000
YTM	158	6.6226	2.5155	11.8231	1.7393	3.6603	0.0104

Panel D: Descriptive Statistics of the Developed countries only							
	Obs.	Mean	Std. Dev.	Max	Min	Jarque-Bera	Prob.
YS	395	182.3104	127.8942	509.5955	20.9810	58.8065	0.0000
D_E	395	436.8051	394.3434	1391.5120	23.0004	76.8145	0.0000
EQ_PRICE	395	130.2561	154.2132	722.4500	13.2475	431.1976	0.0000
EQ_VOL	395	25.8794	11.0320	62.5612	10.0807	87.7026	0.0000
EXCH	395	1.0874	0.1548	1.5255	0.7021	15.0532	0.0005
INFLATION	395	0.7541	0.7891	2.9000	-1.3700	9.3539	0.0093
IR	395	-0.0549	0.3524	0.7000	-0.9000	80.5158	0.0000
YTM	395	8.2527	2.7959	14.5048	2.0279	9.0610	0.0108
Panel E: Descriptive Statistics of the emerging countries only							
	Obs.	Mean	Std. Dev.	Max	Min	Jarque-Bera	Prob.
YS	316	187.5581	101.5986	437.9910	85.5620	49.4171	0.0000
D_E	316	1479.0400	1874.0930	5764.3260	23.6703	68.7857	0.0000
EQ_PRICE	316	3182.6340	5345.0700	16963.7500	8.7550	88.4184	0.0000
EQ_VOL	316	30.3544	8.8629	61.7000	17.3987	60.8183	0.0000
EXCH	316	29.8126	28.0954	90.6710	5.4141	63.9899	0.0000
INFLATION	316	12.7102	26.2569	106.8900	1.0800	1408.5550	0.0000
IR	316	5.2902	1.7899	8.2500	2.2500	26.1593	0.0000
YTM	316	4.9924	2.2405	10.1062	0.7212	7.2611	0.0265

***Source**: Authors estimations on EViews.*

4.2.3 Stationarity tests for variables

To test for stationarity, panel unit root testing was conducted in this dissertation. As explained in section 3.3 in the previous chapter, this is to ensure the inference derived is not based on spurious regression results. The Fisher-ADF unit root test was used to examine stationarity properties in the variables on the panel data set. Their test measures are meant to assess the null hypothesis, that each individual in the panel has non-stationary time series, against the alternative hypothesis, that all individuals' time series are stationary.

Table 4.3 presents the unit root results for the data in its level and first difference forms. From that, we observe that the data in its level form is stationary as all of the probability of the variable t-statistic are all more than 0.05 in its level form, thereby failing to reject the null hypothesis of normality.

Table 4.3: Panel Unit Root Test Results

Data	Variable	Statistic	Prob.
At level	YS	0.934	0.679
	DE	0.6244	0.2713
	EQ	0.504	0.3736
	VOL	0.0787	0.801
	EXCH	0.4262	0.8054
	INFL	0.6933	0.8791
	IR	0.5881	0.4066
	YTM	0.9804	0.9804
First Difference	YS	2.0681	0.0000
	DE	3.8692	0.0000
	EQ	2.7521	0.0000
	VOL	2.9987	0.0000
	EXCH	4.0138	0.0000
	INFL	3.5324	0.0000
	IR	0.7223	0.7532
	YTM	0.4523	0.4672

Source: Authors estimations on EViews.

4.2.4 Cross-Sectional Dependence

The Pesaran CD test was run to test the cross-sectional dependence of the data. The null and alternate hypotheses of the Pesaran CD test are given by:

H_0: $There\ is\ no\ Cross-section\ dependence\ (Correlation)\ in\ residuals$

H_1: $There\ is\ Cross-section\ dependence\ (Correlation)\ in\ residuals$

The test was conducted with the cross-sections of country, industry and level of development, respectively. The results of the test are shown in Table 4.4 below:

Table 4.4: Pesaran CD Cross-Section Dependence Test Results

Cross-section	No. Cross-sections included	Statistic	Prob.
Country	9	14.2782	0.0000
Industry	8	8.6079	0.0000
Market Development	2	0.8555	0.3923

Source: Authors estimations on EViews.

The results indicate that for the country and industry cross sections, we reject the null hypothesis of cross-sectional independence and conclude that there is cross-sectional

dependence in these cross-sections. The level of development, however, meant that we fail to reject the null hypothesis, indicating that there is no cross-sectional dependence between these cross-sections.

4.3 Estimation Results

4.3.1 Fixed effect results

Table 4.5 illustrates the results from the pooled OLS regression run by dividing the data according to country, industry, market development (market), emerging markets and developed markets. The table displays the coefficients and probability statistic of each variable in the data, as well as the fixed effects of each cross-section based on the grouping of the panels.

Based on the reviewed literature, the debt-to-equity ratio has an expected positive coefficient. This is true for panel grouped according to markets, emerging markets and developed markets. However, the results of the fixed effects regression show negative coefficients for the panels grouped according to country and industry. This is contrary to findings reported by Garay et al. (2019). Garay et al. (2019) explain that the acceptable level of debt-to-equity varies based on the country or industry the issuing company is in. The negative coefficient suggests that when the debt-to-equity increases then the yield spreads decrease. This may also suggest that based on certain countries or industries, an increase in the debt-to-equity ratio may indicate a decline in the yield spread. This is because companies in specific countries and industries are expected to maintain a certain level of debt-to-equity ratio.

The debt-to-equity ratio is significant at a 90% confidence level for panels grouped according to markets. Whereas, for the panels grouped according to country and emerging markets, the coefficients are significant at a 95% confidence level. Developed markets panel reported a significance at a 99% confidence level for debt-to-equity.

Table 4.5: Fixed effects Estimation results

Determinants of changes in Yield Spreads.
Fixed Effects Panel Regression where the dependent variable is the Yield spread (YS).
(1) Groups all the countries in the sample.
(2) Groups all the industries in the sample.
(3) Groups the sample by market development.
(4) Grouped by developed markets.
(5) Grouped by emerging Countries.

	(1)	(2)	(3)	(4)	(5)
DE	-0.0095 **	-0.0062	0.0349*	0.2496***	0.0047**
	(-2.2990)	(1.5291)	(1.7341)	(5.4462)	(1.7522)
EQ	-0.0037 *	0.0033	0.0073	0.3315***	-0.0064*
	(-1.9270)	(0.6568)	(1.5762)	(9.0824)	(-4.7760)
VOL	-0.2397	-1.1991 ***	-1.5583***	1.6309***	-1.3649***
	(0.9895)	(-18.16335)	(-3.0098)	(3.8563)	(-5.1912)
EXCH	5.2055 ***	-3.5853 ***	-0.4090	97.9304**	4.9980***
	(6.9848)	(-4.0399)	(-0.2415)	(2.5694)	(9.9970)
INFL	0.2280 **	0.3492 ***	0.1100	11.5741**	-0.0840
	(2.0300)	(3.6195)	(0.4120)	(2.4439)	(-0.9806)
IR	24.0981 ***	-2.6353	8.7948*	25.0229**	27.6014***
	(11.6113)	(-1.2742)	(1.7213)	(2.3878)	(16.2957)
YTM	26.5913	-0.2059	32.0493	20.5121	0.5789
	(1.1928)	(-1.6109)	(0.6739)	(0.8195)	(0.8447)
		Fixed Effect			
Austria	26.8998			64.37838	
Brazil	14.3581				83.3703
India	-431.7853				-363.0040
Italy	239.9383			72.8225	
Mexico	19.6311				147.0259
South Africa	-21.7041				132.6079
Switzerland	107.6032			46.6467	
United Kingdom	135.2245			-73.5497	
United States	-90.1656			-111.298	
Banking		85.2162			
Transportation		-119.3030			
Property		-99.6975			
Financial – Other		-109.1476			
Metals and Mining		643.1149			
Health Care		-60.7061			
Retail Stores – Other		-103.6280			
Utility – Other		-235.8489			
Developed Markets			-10.8306		
Emerging Markets			10.8306		
Cross-sections included	9	8	2	5	4
Observations	711	632	158	395	316
Adjusted R-Squared	0.9155	0.9505	0.7444	0.9206	0.9567
Root MSE	31.6456	28.2756	6.8249	31.6700	17.9557

Note: *(*, **, ***) denotes statistical significance at 10%, 5% and 1%.*
Source*: Author's calculations, robust standard errors reported.*

The equity price was only found to be significant at a 90% confidence level for the panel group assembled by country and the emerging markets panels. For both these panels, the negative coefficient is as expected from the literature review. But for panels grouped according to industry and markets, the coefficients are illustrating a positive

relationship to yield spreads. The panel also grouped according to developed markets found a negative coefficient that is significant at a 99% confidence level. This is contrary to findings by Radier et al. (2016). The findings from the fixed effects analysis yielded inconclusive results for the equity price.

The equity volatility was found to be significant at 99% confidence intervals by all panel groups except the panel grouped according to country. The coefficients were negative for all panels, except the developed markets panel. This means that the equity volatility demonstrates the expected negative relationship with yield spreads based on the literature review. In line with previous studies including Garay et al. (2019), it is also found that changes in equity volatility have a positive effect on the yield spreads.

The exchange rate was found to be significant in country level panel, developed and emerging markets panels, whereas, for the markets and industry level panels, the exchange rate was found not to be a significant determinant of yield spreads. The exchange rate showed positive coefficients that are significant at a 99% confidence level for the country and emerging markets panel levels. Although the exchange rate showed a negative coefficient that is significant at a 99% confidence level for the industry panel level. These results are conveying contradictory results. Additionally, a study by Gadanecz et al. (2014), who also applied a static panel regression model returned significant negative coefficients in their study. However, the literature indicates that there should be an expected positive coefficient between the exchange rate and yield spreads.

The inflation was found to have a positive coefficient for all panel groups except for the emerging markets group. This is similar to findings by Gadanecz et al. (2014) who also reported a positive coefficient for inflation. Gadanecz et al. (2014) explain that an increase in the change of inflation can explain an increased change in yield spreads. Inflation was also found to be significant at a 99% by the industry panels and 95% confidence interval in the panels grouped according to country and developed markets.

The interest rate was found to have positive coefficients for all the panels, except for the Industry panel. All the positive coefficients were found to be significant at a 90%,

95%, 99% and 99% confidence levels for the markets, developed markets, emerging markets and country panels, respectively. This is not in line with results found by Grandes and Peter (2004) as well as Radier et al. (2016) who found negative and significant coefficients.

The years-to-maturity was found not to be significant in explaining changes in yield spreads. The country, level of development and developed markets panel groups returned positive coefficients, whereas, the industry and emerging markets panel groups presented negative coefficients. Studies by Grandes and Peter (2004) as well as Garay et al. (2019) also reported negative coefficients. They indicate that negative coefficients may be as a result of possible negative slopes in the term structures of corporate bonds.

From the panels grouped according to country, emerging and developed markets, the following can be observed. (i) countries such as Austria, Brazil, Italy, Mexico and Switzerland, have a positive individual fixed effect on the changes in yield spreads. This means that the yield spreads of bonds issued from these countries will have higher yield spreads based on the unobserved factors in those countries. (ii) On the other hand, the US shows a negative individual fixed effect. For example, the yield spreads of bonds issued in the US have yield spreads that are less than the norm as they are affected by unobserved factors applicable to the US as a country. (iii) South Africa has shown a negative individual fixed effect on the yield spread when all countries are grouped, but a positive individual fixed effect when in the emerging markets group only. This is also similar to the UK, which has a positive effect when all countries are grouped, but a negative effect when it is only developed markets. (iii) Additionally, the results also indicate that developed markets have an effect of -10.8306 on the yield spreads of corporate bonds, whereas the results of emerging markets show the opposite. This means that the level of development in a country does impact changes in yield spreads. Countries in developed markets will in general have lower yield spreads than emerging countries.

The transportation, finance, property, healthcare, retail and utility industries all have negative individual fixed effects reported by the LSDV estimator. This means that the average yield spreads would be reduced by the calculated quantum, only because the

corporate bond was issued by a company from these industries. But, for the Banking as well as the metals and mining industries, there is a tendency to have higher yield spreads as the individual fixed effects are positive. For the markets panel, the results indicate that developed markets have a negative individual fixed effect, meaning that economic and market development levels lower the cost of funding, which further reduce yield spread. On the other hand, the individual fixed effect for emerging markets is the complete opposite, thereby indicating that being emerging market drives corporate yield spreads up.

The adjusted R-squared depicts the degree in which variations in yield spreads are explained jointly by factors that are common across the countries, industries and level of development and by the variations in the explanatory variables. The estimated adjusted R-squared are 91.55%, 95.05%, 74.44%, 92.06% and 95,67% for the panels grouped according to country, industry, markets, developed markets and emerging markets, respectively. The results can be interpreted in this manner, with a country panel example. This means that all the explanatory variables including unobserved country effects explain 91.55% of the variations in yield spreads. This indicates that the variables utilised in this study explain a large percentage of variations in yield spreads.

The F-statistic estimates whether the explanatory variables jointly explain the changes in yield spreads. The null hypothesis of the F-Statistic test states that the coefficients of the explanatory variables are all zero, and the alternate hypothesis states that at least one of the coefficients of the explanatory variables is different from zero. The probability value of the F-Statistic is used as a decision criterion to either reject or fail to reject the null hypothesis at a specified level of significance, in this case 5%. A level of significance denotes the probability of committing a Type I error, for example, rejecting the null hypothesis when it is true. The lower the level of significance, for example 1% compared to 10%, the lesser the probability of committing a Type I error. For all panel groups, the probability of the F-Statistic is 0.0000 which is less than 0.05. This means that the null hypothesis is therefore rejected at the 5% level of significance. We can conclude that the explanatory variables are jointly significant in explaining changes in yield spreads.

Some of the results found from the fixed effects may be inconsistent due to econometric issues identified in chapter 3. The first one is the cross-sectional dependence. This is when all units in the same cross-section are correlated (Burdisso & Sangiacomo, 2016). From the Pesaran CD Cross-Section Dependence test conducted in section 4.2.3, there is cross-sectional dependence in the data. The LSDV estimator is not equipped with handling this problem. The second issues are the omission of the dynamics, which is materialised by the inclusion of lag dependent variable henceforth the related endogeneity. To correct the shortcoming of the fixed effects model, the Pooled Mean Group dynamic panel model will be conducted. The results are discussed in the next section.

4.3.2 Pooled Mean Group Results

Table 4.6 illustrates the results from the Pooled Mean Group regression run by dividing the data according to country, industry, markets, emerging markets and developed markets. The table illustrates the coefficients and probability statistic of each variable in the data set, for the long run equations.

Table 4.6: Long term Pooled Mean Group estimates

Determinants of changes in Yield Spreads.
PMG estimator where the dependent variable is the First Differenced Yield spread D(YS).
(1) Groups all the countries in the sample.
(2) Groups all the industries in the sample.
(3) Groups the sample by country development.
(4) Grouped by Developed Countries Only.
(5) Grouped by Emerging Countries Only.

	(1)	(2)	(3)	(4)	(5)
DE	-0.0071**	0.0014	-0.0085	0.7675**	-0.0215*
	(-2.3335)	(0.8819)	(-0.2101)	(2.3696)	(-1.6866)
EQ	-0.005***	0.0129	-0.0018	0.7637***	0.2302
	(-3.8634)	(1.2971)	(-0.1609)	(3.1614)	(0.7767)
VOL	0.8141**	0.3491	-1.0596	0.5457	5.1771***
	(2.4926)	(0.5509)	(-1.6229)	(0.4482)	(2.3500)
EXCH	-7.549***	-0.4025	4.7557	-16.2617	8.5952*
	(-3.6409)	(-0.2101)	(1.3471)	(-0.0985)	(1.8716)
INFL	0.3529	-0.1176	-0.9471*	-6.5275	0.6128***
	(0.2054)	(-1.3118)	(-1.7836)	(-0.4808)	(2.1839)
IR	7.7654**	9.9193***	16.7841	-65.4447*	14.7711
	(2.3864)	(4.4599)	(1.2825)	(-1.9007)	(1.3660)
YTM	2.8299*		-4.8351**	36.1632***	-17.7875***
	(1.8232)		(-2.3988)	(4.0862)	(-2.6015)
Cross-sections	9	8	2	5	4
Observations	702	600	150	390	312
Root MSE	11.2810	8.9006	3.8943	12.6477	7.7921

Note: *(*, **, ***) denotes statistical significance at 10%, 5% and 1%.*
Source*: Author's calculations, robust standard errors reported.*

The model allowed for a maximum 4-period lag, with the maximum lags length being selected using the Akaike info criterion (AIC). The AIC estimates the in-sample prediction error and thus the quality of the statistical model for the set of data (Brewer, Butler, & Cooksley, 2016). The expected error in forecasting the resampled response to a training sample is called the In-sample prediction error (Brewer et al., 2016). AIC then approximates the quality of the models relative to each of the other models collected during the above-mentioned exercise (Brewer et al., 2016). This enables us to select the best model that explains the variations in the yield spreads. The panel grouped according to country, developed markets and emerging markets only estimated an ARDL (1,1,1,1,1,1,1,1) for all countries in the study. Whereas the panel grouped according to industry estimated an ARDL (3,4,4,4,4,4,4,4) for all the 8 industries in the study. Finally, the panel grouped according to markets estimated an ARDL (4,2,2,2,2,2,2,2).

Table 4.7 illustrates the results from the short term Pooled Mean Group regression ran by dividing the data by country, industry, markets, emerging markets and developed markets. The table illustrates the coefficients and probability statistic of each variable in the data set, for the short run equations. When the error correction term (COINTEQ01) is negative and significant, it portrays a cointegration relationship between the dependent variables and the explanatory variates (Chrysost & Eggoh, 2012). This is the long-term relationship. The error correction term indicates the speed of adjustment to restore the shocks to equilibrium (Chrysost & Eggoh, 2012). This term should be significant with a negative sign indicating the correction. Highly significant speeds of adjustments also confirm the presence of a steady long-run relationship. For this study, all panels have emerged to indicate a long-term relationship between the dependent and explanatory variables.

Table 4.7: Short term Pooled Mean Group estimates

Determinants of changes in Yield Spreads.
PMG estimator where the dependent variable is the First Differenced Yield spread D(YS).
(1) Groups all the countries in the sample.
(2) Groups all the industries in the sample.
(3) Groups the sample by country development.
(4) Grouped by Developed Countries Only.
(5) Grouped by Emerging Countries Only.

	(1)	(2)	(3)	(4)	(5)
COINTEQ01	-0.0673**	-0.1535***	-0.1817***	-0.0726*	-0.0797*
	(-2.1103)	(-4.4298)	(-161.5955)	(-1.763)	(-1.8042)

D(YS(-1))		0.0787	0.3219**		
		(1.3944)	(2.4289)		
D(YS(-2))		0.0903*	-0.0191		
		(1.7074)	(-0.1637)		
D(YS(-3))			0.1527		
			(1.0174)		
D(DE)	-0.0055	-0.2638	-0.0194	-0.0509*	-0.0122*
	(-0.5477)	(-1.0368)	(-0.5949)	(-1.7363)	(-1.6331)
D(DE(-1))		-0.0098	-0.0119		
		(-0.3771)	(-0.8525)		
D(DE(-2))		0.0325			
		(0.6653)			
D(DE(-3))		-0.3749			
		(-1.5557)			
D(EQ)	-0.2425	-1.0081	0.0460	-0.5457	-0.0111
	(-0.9014)	(-1.4667)	(1.0019)	(-1.2483)	(-0.0918)
D(EQ(-1))		-0.0793	0.0736		
		(-0.5444)	(1.0100)		
D(EQ(-2))		-1.1862			
		(-0.8824)			
D(EQ(-3))		-0.5475			
		(-0.6334)			
D(VOL)	0.4625*		0.9800***	0.0627	1.0949
	(1.6700)		(43.7015)	(0.3158)	(1.4900)
D(VOL(-1))		0.5095**	0.1087		
		(2.1173)	(0.9555)		
D(VOL(-2))		-0.1125			
		(-0.9225)			
D(VOL(-3))		-0.0520			
		(-0.2217)			
D(EXCH)	29.7200	-5.1716	35.2273	46.3748	1.8103**
	(1.3372)	(-1.0130)	(1.0138)	(1.2146)	(2.0562)
D(EXCH(-1))		1.5562	28.7329		
		(0.4003)	(0.8717)		
D(EXCH(-2))		5.1088			
		(0.8711)			
D(EXCH(-3))		1.0818			
		(0.1662)			
D(INFL)	-2.5581	5.2067	-3.1395	-2.0421	0.3854**
	(-0.5959)	(1.5098)	(-0.9581)	(-0.3492)	(1.9257)
D(INFL(-1))		-8.6558	7.4206		
		(-0.9386)	(1.0072)		
D(INFL(-2))		6.4549			
		(1.6113)			
D(INFL(-3))		0.3050			
		(0.1545)			
D(IR)	11.2817	-0.7250	-10.4992***	12.8902	-2.0315
	(1.0500)	(-0.0946)	(-3.2241)	(0.7839)	(-1.2619)
D(IR(-1))		4.2064	-7.4882***		
		(0.3761)	(-2.8316)		
D(IR(-2))		12.7730			
		1.5321			
D(IR(-3))		6.1477			
		(0.6050)			
D(YTM)	116.7308		381.7039	102.2889	
	(04706)		(1.3610)	(0.3171)	
D(YTM(-1))			303.1598		
			(1.0206)		

Note: *(*, **, ***) denotes statistical significance at 10%, 5% and 1%.*
Source*: Author's calculations, robust standard errors reported.*

Apart from inflation, all the explanatory variables including unobserved country effects were found to explain variations in the corporate yield spreads in the long run. The years-to-maturity was significant at a 90% confidence level whereas the equity volatility, debt-to-equity ratio and interest rates were found to be significant at a 95% confidence interval. Finally, the equity price and exchange rate were both significant at a 99% confidence level. The debt-to-equity ratio, exchange rate and interest rate all had coefficients that were not as expected from the literature. These were found to be negative, negative, and positive, respectively. But the equity price, equity volatility and years-to-maturity all had the expected relationships with the yield spread as portrayed in literature. In the short run results, the equity volatility was found to be the only variable that impacts changes to the yield spreads.

The results for the panel grouped according to industry indicate that only the interest rate was found to be significant at a 99% confidence level. Similar to the country panel, industry level results returned a positive relationship between the yield spread and interest rate. This is contrary to the literature but in agreement with findings by Radier et al. (2016). In the short run results, thefirst lag of the first difference of equity volatility was found to be the only variable that impacts changes to the yield spreads. This returned a positive coefficient that is significant at a 95% confidence level.

The markets panel only returned the inflation and years-to-maturity as determinants of changes in yield spreads in the long run. The years-to-maturity returned a coefficient that is negative and significant at a 90% confidence interval. This may not be as expected from the literature. However, studies by Grandes and Peter (2004) along with Garaya et al. (2019) also found significant negative coefficients. In the short run, the first differenced volatility was found to significantly impact the changes in yield spreads at a 99% confidence. The 1-period lagged first differenced yield spread was also found to impact the yield spread in the short run. Lastly, both the first differenced and 1-period lag first differenced interest rate impacts the variations in yields spreads.

The long run results for developed and emerging panels indicate that the debt-to-equity ratio and years-to-maturity are significant in explaining yield spreads. However, in the long run, the equity price and interest rate are only significant in explaining changes in yield spreads in developed markets. The study also indicates that the equity volatility, inflation, and exchange rate are significant in explaining changes in

yield spreads for emerging economies in the long run. In the short-run, the first differenced debt-to-equity ratio is significant in both emerging and developed markets. Whereas the first differenced exchange rate and inflation are significant in explaining yield spreads in emerging markets. Table 4.8 below summarises the expected and observed outcomes for emerging and developed markets using the fixed effects regression. The fixed effects regression results indicate that the drivers of yield spreads are predominantly the same between emerging and developed countries. Where the debt-to-equity ratio, equity price, equity volatility, exchange rate and interest rates (IR) were found significant in explaining variations in yield spreads in both developed and emerging markets. The exception is the inflation rate, which was to only be significant in explaining changes in yield spreads in developed markets. The time-to-maturity was found not to be significant in both emerging and developed markets.

Table 4.8: Regression Summary

Fixed Effects Regression			
Variable	**Expected outcome**	**Estimated Outcome: Developed Markets (4)**	**Estimated Outcome: Emerging Markets (5)**
D/E	+	+ ***	+ **
EQ	-	+ ***	- *
VOL	+	+ ***	- ***
EXCH	+	+ **	+ ***
INFL	+	+ **	-
IR	-	+ **	+ ***
YTM	+	+	+
Long Run PMG Regression			
Variable	**Expected outcome**	**Estimated Outcome: Developed (4)**	**Estimated Outcome: Emerging (5)**
D/E	+	+ **	- *
EQ	-	+	+
VOL	+	+	+ ***
EXCH	+	-	+ *
INFL	+	-	+ ***
IR	-	- *	+
YTM	+	+ ***	- ***

Note: (*, **, ***) denotes statistical significance at 10%, 5% and 1%.
Source: Author's calculations, robust standard errors reported.

Table 4.8 also summarises the expected and observed PMG results for emerging and developed markets, using the long run results. The PMG regression results indicate that the drivers of yield spreads are not the same between emerging and developed countries. The debt-to-equity ratio and time-to-maturity were both found to be significant in explaining variations in yield spreads in both developed and emerging markets. However, the Interest rate was only found to be significant in explaining changes in yield spreads for developed economies. The inflation rate, exchange rate and equity volatility were only found to be significant in emerging markets.

4.4 Conclusion

A comparison of the results estimated using the fixed effects and PMG panel regression models was conducted in this study. This paper aimed at answering the question of whether determinants of changes in corporate yield spreads differ across emerging and developed markets. The results from the PMG regression concluded that determinants of yield spreads are different based on the level of development of a country, even though some variables are shared determinates in both markets (for example debt-to-equity ratio and years-to-maturity). This study found that in the long run, the equity volatility and inflation are determinants of yield spreads in emerging markets. Additionally, in the long run, the interest rate was found to be a significant driver of yield spreads in developed markets. In conclusion, the results of this study support the hypothesis that determinants of yield spreads are different based on the level of development of a country.

This dissertation also sought to answer the secondary objectives outlined in section 1.3. (i) The study aimed to identify the variables that are determinants of changes in yield spreads. The results of this study indicate that the variables equity price, equity volatility, debt-to-equity ratio, years-to-maturity, interest rates, inflation and the exchange rate are all essential in explaining changes in yield spreads. This is also proven by the high adjusted R-Square resulted from the model estimation outputs.

(ii) The second objective was to determine whether the industry that the issuer operates in, is a determinant of changes in yield spreads.

(iii) The third objective was to determine whether the country the issuer operates in, is a determinant of changes in yield spreads. This study concludes that industry and country are also important drivers of changes in yield spreads as indicated by significant individual specific fixed effects.

(iv) The final objective was to determine the best estimation technique, which explains the changes in yield spreads based on its ability to address problems inherent in time series panel data. This study employed a fixed effects model, which was found to be used predominantly in the literature studying this topic, as well as the PMG model. Although the fixed effects model solves for the problems related to heterogeneity bias in the variables, it has some limitations that PMG model can mitigate. Mainly because the analysis is based on a dataset that has a larger T than N, cross-sectional dependencies are a major complication. The PMG estimator is consistent in the presence of cross-sectional dependence while allowing to model both short term and long-term dynamics that characterise nonstationary panel time series.

CHAPTER 5: SUMMARY AND CONCLUSION

This dissertation investigates the determinants of the corporate bond yield spreads in developed and emerging economies. This study uses company, industry, and country specific variables to assess key drivers of corporate bond yields in developed and emerging markets. Companies and investors are mainly interested in the yield spread as it is the risk varying premium investors will charge corporates. This makes the yield spread the cost of borrowing. Understanding what drives the cost of borrowing enables companies to better manage their financials. Investors will be interested in the determinants when conducting analysis for their investments. The fixed effects and PMG panel regression models were conducted to study the determinants of the yield spread by dividing the data according to country, industry, country's level of development, emerging markets and developed markets.

In chapter 2 of the study, a review of the literature on yield spreads was conducted. It was established that a corporate's yield spread is the varying risk premium that corporate lenders assign to companies, which includes the credit, market, and liquidity risk as to the corporate response to financial shocks during its business cycle. A high yield spread indicates a higher premium for the perceived higher risk the corporate presents. From that, it was understood how the yield spread impacts the cost of funding for a corporation, which has a large impact on their profits. This chapter also recognised three major differences between developed and emerging markets which were identified to impact the determinants of yield spreads. Firstly, the study explained that developed markets are larger and more liquid than emerging markets. Secondly, differences in fiscal and monetary policies between countries in developed and emerging markets can affect corporate risk profile. Lastly, the large difference in the credit quality of countries in developed and emerging markets was discussed, with possible impact on corporate yield spreads.

Chapter 3 discussed the econometric methodology, including the two panel data approaches employed in this dissertation. An outline of the model's advantages and disadvantages, as well as the basis for the selection of the PMG panel regression model as the most suited estimator for determining the drivers of yield spreads, was also discussed.

The results of the estimations were discussed in chapter 4 of this dissertation. The study concluded that both country and industry effects were significant in explaining changes in yield spreads. This was like studies by Cavallo and Velenzuela (2010) as well as Garay et al. (2019), who found that the yield spread would change based on the country or industry the bonds are issued from.

The study also concluded that the level of development is also significant in explaining changes in the yield spread as from both the fixed effects and PMG results. Additionally, the paper found that the determinants of yield spreads in emerging markets may differ from the ones observed in developed markets. For emerging markets, the yield spread exhibited significant long term relationships with the equity volatility, inflation and the exchange rate. Developed countries showed that the yield spread has a long term relationship with interest rates. Both the debt-to-equity and

years-to-maturity are signgificant in developed and emerging markets. This is in agreement with comments made by Gadanecz et al. (2014), who state that emerging and developed markets may be impacted by different determinant factors.

When analysing the possible changes in yield spreads, cost of funding, this study recommends that researchers and industry practitioners consider the equity volatility, inflation, exchange rate and debt-to-equity ratio when considering the drivers of corporate bond spreads for emerging countries. Furthermore, the study recommends that the interest rate and debt to equity ratio be considered when assessing drivers of corporate bond spreads. The study also found that there are unobserved industry and country factors that need to be considered when assessing corporate bonds.

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